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Big Sky CLEARWATER

Volume VII October 1977 *OFFICIAL BULLETIN* No. 4

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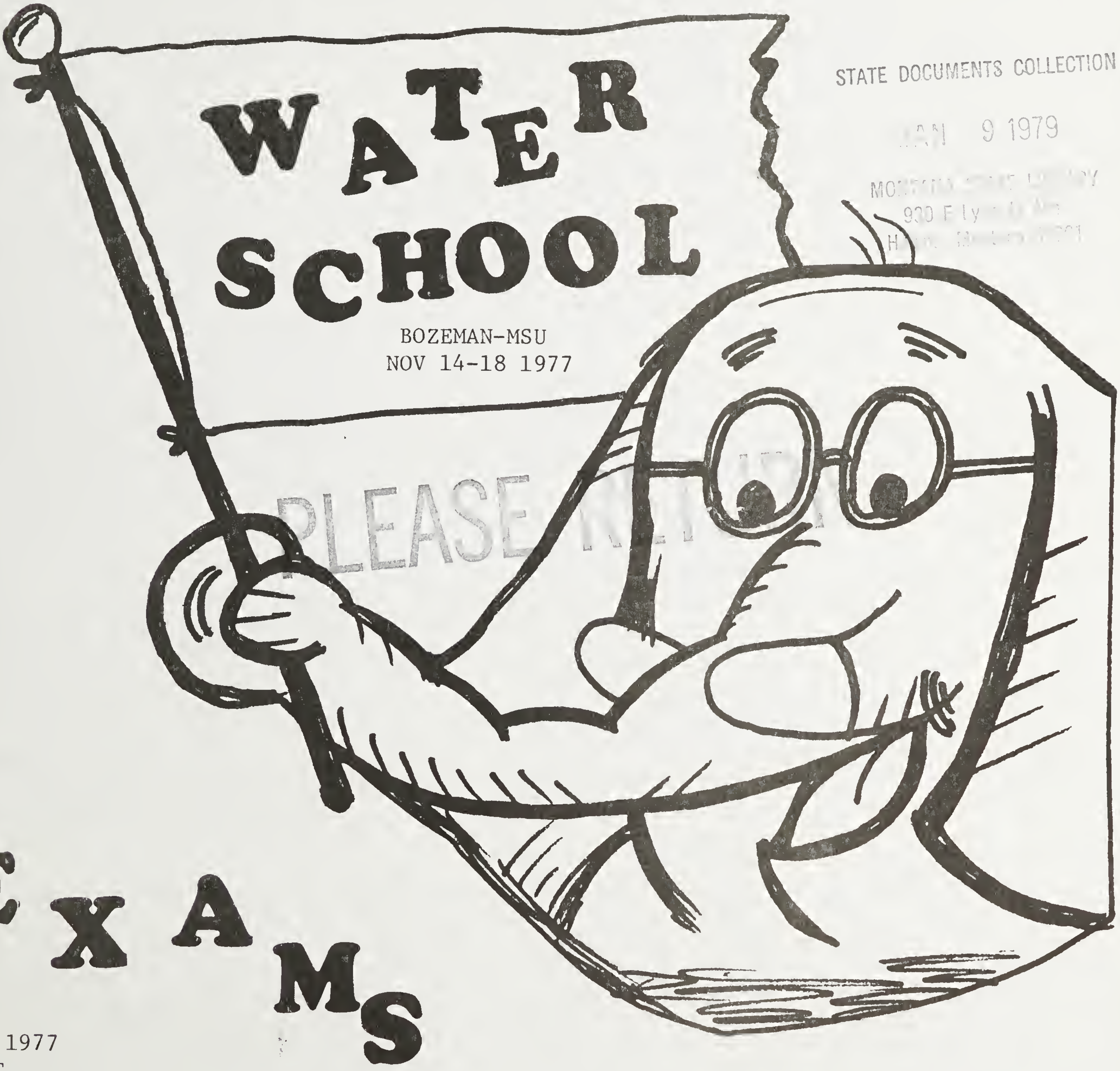

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44th Annual
Water/Wastewater Operators' School

The annual short course for water/wastewater operators and managers will be held at the Student Union Building, MSU from 8:00 AM, Monday, November 14 through 2:30 PM, Friday, November 18.

Feature speaker this year is Dr. E. Joe Middlebrooks, Dean of Engineering, Utah State University, an acknowledged U.S. expert on lagoons.

Primarily because of your requests, several changes have been made in the school this year.

1. The certification examination is to be held two weeks after the Water School (on December 3 at Miles City, Missoula, Bozeman, and Havre) to give operators a chance to study and apply the knowledge they gained at the Water School.

2. The program has been revised to meet the needs of all operators by separating some of the lectures for water and for wastewater operators and by separating workshops and some lectures into sections groups for advanced, intermediate, and elementary groups which correspond to Classes I and II III, and IV and V of the Certification Examination.

3. A Friday morning "examination" workshop has been added in which operators will be helped to answer questions and to work problems of the general types given in the Certification Examination at all levels.

4. An entire half-day is scheduled for operators of activated sludge plants, while other operators study a variety of subjects.

5. Half a day will be devoted to a study of upgrading effluent from lagoons to meet new state standards. Selection of method, construction requirements, and (particularly) operation will be stressed by the leading U.S. expert, Dr. E. Joe Middlebrooks, Dean of Engineering, Utah State University.

6. From now on, all operators who use chlorination equipment will be required to be able to calculate relations between required dosage, flow and monthly utilization of chlorine. Hence, we will train operators to work typical problems. All operators should bring pocket calculators. (If you are adept with a slide rule, a slide rule can be substituted.)

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7. An entire day has been scheduled for those who manage the larger water treatment plants to study water conditioning for corrosion control and pipeline protection. Aggressive waters, which cost the nation more than 375 million dollars annually, can be neutralized and public health protected from dissolved lead and copper by the process to be studied.

8. The fee is increased to $45. A decade ago the fee was $35 and living costs have, in general, risen by more than 80 percent. Our conference costs have risen also, and for the first time we must pay for the use of the Student Union Building. Nevertheless, we have held the increase in the fee to a modest 29 percent.

Other subjects will not be neglected. Basic chemistry, microbiology, mathematics, and general subjects such as pump maintenance, hydrant and valve maintenance, flow measurement, and other general subjects will be covered this year as in previous years.

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KEN JOHNSTON RETIRES

On July 1, 1977, we lost our co-editor of Big Sky Clearwater and our operator training instructor. However, we had the good fortune of having the use of Ken's services for six years. Hopefully, we can replace Ken with someone who has some of his capabilities for operator training.

Ken came to work for the Department in 1971 when the federal government provided a training grant to the State. Rollie Adams, who retired two years ago was also employed at that time. Between Kenny and Rollie, they established the State's training program, as prior to this time, the State had never had a full-time training instructor. The original program was based on a 22-week training program where there was one evening of classroom instruction per week and the remainder of the time was

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KEN JOHNSTON

spent on the job with the operators who were enrolled in the program. Federal grants for training eventually disappeared

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and the State legislature continued funding of the program with one person. With this change, the State had much more flexibility in the type of program to be used. Kenny used a variety of training approaches, including video tape programs, home correspondence, one-day seminars, activated sludge and other workshops plus the established 22-weeks course and the Annual School held in cooperation with MSU. The majority of operators in the State have received some training from him.

When Ken came to work with the Department, he had about completed 20 years of work with Phillips Petroleum Company in refinery operations. He took a substantial cut in salary to do what he wanted to do - working with and helping others. He is still busy doing the same, only with many more projects. Retirement for people like Ken is the opportunity to get involved in many more things (most of which do not pay).

In case any of you wish to contact Ken, he lives north of Avon with his wife Martha and son Phil (the last one at home). His address is Box 307, Avon, Montana 59713. He is still working on a part-time basis with the Department to help us out until we can find a replacement.

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WATER SUPPLY TRAINING WORKSHOP

Martha Dow, N.M.C.

A 5-day workshop in Water Supply Personnel Training was conducted the week of September 12 through September 16 on the Northern Montana College campus under the auspices of the College and the Montana Department of Health and Environmental Sciences. The training course was funded through a grant from the Environmental Protection Agency.

The workshop covers such areas as mathematics, chemistry, hydraulics, microbiology,

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Ralph Shirley deep in thought trying to answer a question put to him during the workshop water treatment processes and operation, electricity, equipment maintenance, and current regulations. Experts lectured in their professional areas and demonstrated laboratory techniques. Arthur Clarkson, MDHES; Ken Johnston, former MDHES training officer; Bill Engle, EPA; Ralph Shirley, Billings electrician; and Gerald Bekker and Martha Anne Dow of Northern Montana College served as instructors.

Purpose of the workshop was to provide a training program for water personnel because of new federal regulations which became effective in June. Contact Martha A. Dow, Director, Science Department, Northern Montana College, for information on the workshops.

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NEWS ABOUT THE ASSOCIATE DEGREE PROGRAM IN ENVIRONMENTAL HEALTH: WATER/WASTEWATER TECHNOLOGY AT N.M.C.

Fall quarter began at N.M.C. the week of September 26 with about 16 new students in the water/wastewater program. Several students participated in summer, 1977 internships at Lewistown, Havre and the Environmental Protection Agency in Denver. Plans are being made to apply for federal funding to build a training facility on the campus. This facility would provide students with the opportunity to have a "hands on" experience with all aspects of wastewater plant operations.

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DOG DAYS AT HEBGEN LAKE

Dr. Loren Bahls
Limnologist
Water Quality Bureau

As algae go, Anabaena flos-aquae is pretty low on the totem pole. Its spherical cells are less than a hair's width in diameter. Like the bacteria to which it is closely allied, Anabaena lacks a cell wall and a true nucleus. Yet, for all its primitiveness, this little aquatic plant virtually ruled the northern part of Hebgen Lake for much of last summer.

Trouble came quickly and unexpectedly when, about mid-June, dogs started getting sick and dying at a popular Forest Service campground on the Lake's Grayling Arm. Soon afterward, nearly 40 head of cattle were lost nearby. The symptons in both cases were similar and there was a common denominator; all the affected animals apparently drank from the lake shortly before they became ill. On closer inspection, the water in Grayling Arm looked like "pea soup" or "green latex paint", a sure sign of a blue-green algal bloom.

While single cells of Anabaena are microscopic and inconspicuous, they unite end-to-end to form many-celled chains like beads on a string, which in turn intertwine with other chains to form visible clumps. When conditions are just right, as they apparently were in Hebgen last summer, Anabaena can double its biomass every 24 hours or so until it colors the water a dirty pea green, at which time it is said to "bloom". Such a bloom by itself is not enough to kill healthy dogs or to bowl over full-grown steers in a matter of minutes. Another element is required, namely an extremely potent toxin called very-fast-death-factor.

Anabaena is one of about a dozen native blue-green algae that have the potential of making lake water poisonous in Montana. The toxin, lethal only to warm-blooded animals, is swift acting; mice injected with it have died within 30 seconds. The toxin is apparently produced only when the algae bloom, but a bloom does not necessarily mean that the water is poisonous. Some strains of algae produce toxins while other strains of the same species do not. Toxic and harmless strains are identical under the microscope. The only way to tell them apart is by injecting a quantity of the algae into a laboratory animal. This was how the causative agent of the Hebgen problem was confirmed.

What triggers the algae to "bloom" in the first place? Why are some blooms merely obnoxious, while other are deadly? The reasons still are not clear, but it is known that environmental factors such as light, temperature and nutrients (nitrogen and phosphorous) play an important role. (Midsummer blue-green algae blooms are not uncommon on other Montana reservoirs; Canyon Ferry, Yellowtail, Koocanusa and others have experienced them.) In order to try to answer these questions, the Water Quality Bureau teamed with the U.S. Forest Service, Gallatin County, and the Microbiology Department at Montana State University in collecting chemical, physical, and biological parameters relating to the Hebgen episode. It is suspected that the unusually low water conditions of 1976-1977 contributed to the problem. In the future, it is hoped that concentrations of potentially dangerous algae can be detected early by aerial photography and tested for toxicity before they wash ashore and jeopardize the lives of people, pets, and livestock.

Whatever the cause, the shorter days and cooler weather of August and September brought an end to the problem on Hebgen Lake at least for this year. What about next year? Where will it strike next? Perhaps when all of this summer's data is in and carefully evaluated, we will have a better idea. But, with the vagaries of weather and Mother Nature, we will probably still be guessing.

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STATUS OF SAFE DRINKING WATER PROGRAM IN EASTERN MONTANA

by Alf Hulteng

As almost everyone by now knows, the Safe Drinking Water Act became effective in June of this year, and all water suppliers and the Water Quality Bureau are in the process of fulfilling the requirements set forth by this Act. These requirements are having an impact on all water suppliers, but it is smaller systems that appear to be affected the most. Water suppliers that serve mobile home courts are particularly affected by this law because many of these systems have performed little water quality monitoring in the past.

Most of the mobile home courts in the Eastern part of Montana that are covered under this law have been inventoried and have been set up on a monthly bacteriological monitoring schedule. Besides these bacteriological tests, the water supplies must also be examined for levels of certain inorganic chemicals. Samples are starting to be collected for this purpose. We are also attempting to certify at least one

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operator tp be in responsible charge of each mobile home court water system. It is hoped that these examinations can be given in the near future.

Most of the cities and towns have been on a bacteriological monitoring program for years, but extensive chemical quality analyses have not generally been performed. Chemical analyses have now been completed for many of these communities and it was found that the supplies generally satisfy the maximum contaminant levels set by the "Safe Drinking Water Act". There were a few exceptions, however; with the fluoride standards presenting the biggest problem for a few communities. Daily turbidity monitoring was another requirement that many of the smaller communities with surface water supplies had not done before. Monitoring for turbidity has been going well though, and most of the communities that needed to obtain a turbidimeter have now obtained one.

Besides the necessary water quality monitoring, the aspect of this law that probably affects these water systems the most is the public notification portion. It is necessary to give notice to the public by mail and also through the newspapers and radio and TV whenever a maximum contaminant level for a bacteriological or chemical standards is exceeded. There has already been a few cases in eastern Montana where public notification has been required.

Many other water supplies come under this act that have not been regularly inspected in the past. These supplies are called non-community public water supplies and include such establishments as restuarants, motels, campgrounds, schools, and service stations. Non-community water systems have until June, 1979 to comply with this law, however; many of these have already been inventoried as we try to determine how many of these supplies wer have and where they all are.

If you have any questions on the "Safe Drinking Water Act", feel free to contact the Water Quality Bureau at one of our offices located in Helena, Billings, or Kalispell.

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FREQUENCY OF MONITORING, ANALYSIS, ETC.

	COMMUNITY, SURFACE WATER	COMMUNITY, GROUND WATER	NON-COMMUNITY
MICROBIOLOGICAL (Notify when confirmed by 2 check samples)	1-500/month, depending on size		1/Quarter
TURBIDITY (Notify if monthly average exceeds one T.U. or if average of 2 consecutive days exceeds 5 T.U.	Daily		(Surface Water) Daily, beginning 6/24/79
INORGANIC (Except Nitrate) (Notify if average of 4 analyses during one month exceeds MCL)	First analysis completed by 6/24/78 and yearly	First analysis completed by 6/24/79 and every 3 years	
NITRATE (Notify if average of 2 samples within 24 hrs. exceeds MCL)	First analysis completed by 6/24/78 and yearly	First analysis completed by 6/24/79 and every 3 years	By 6/24/79 and at intervals set by state
ORGANICS (Notify if average of 4 samples during one month exceeds MCL)	First analysis completed by 6/24/78 and at intervals set by state (at least every 3 years)	First analysis completed Only those systems specified by state	
RADIONUCLIDES, Alpha particle, R-226, R-228 (Notify if average annual MCL for gross alpha particle or for total radium is exceeded	First analysis completed by 6/24/80, and every 4 years (may be ordered more frequently by state in vicinity of mining or other operations		
RADIONUCLIDES, Manmade (Notify if average annual MCL for manmade radioactivity is exceeded	(Serving more than 100,000 persons, and other systems at discretion of state) by 6/24/79, and every 4 years		
Gross Beta particle activity	(Certain systems designated as using waters contaminated by effluent from nuclear facilities) Quarterly		

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INVESTIGATION OF DILUTIONS USED IN THE FIVE DAY BIOCHEMICAL OXYGEN DEMAND (BOD_5) TEST

by Dick Karp
Water Quality Specialist
Water Quality Bureau

An investigation was made as to the effect dilutions used on a wastewater sample, such as a sewage lagoon effluent, have on results obtained from the Five-day Biochemical Oxygen Demand (BOD_5) Test. It had been noticed that for a series of different dilutions, the dilution made with the largest amount of sample, results in the lowest BOD_5 value and that the dilution made with the smallest amount of sample, results in the highest BOD_5 value. The questions is: Which value is best?

In this investigation, dextrose (glucose) was used to produce a BOD in dilution water (BOD dilution water, Standard Method, 13th Edition, 1971). A theoretical value for the BOD_5 can be calculated based on the concentration of dextrose, the concentration of oxygen in the dilution water and assuming almost complete oxidation of the available oxygen within 5 days.

Figure 1 indicates the larger the concentration of dextrose used, the larger the difference, $BOD_5^t - BOD_5^a$. This graph, Figure 2, indicates the same general trend, i.e., an increase in the percentage; $\frac{(BOD_5^t)}{(DO_i)}$ x 100%, results in an increase in the difference ($BOD_5^t - BOD_5^a$). Assuming this relation to be linear results in the straight line in Figure 2. The line indicates a difference ($BOD_5^t - BOD_5^a$) of zero occurs when the percentage; $(\frac{BOD_5^t}{DO_i}$ x 100%) is 45 (roughly a little less than one-half) and that for a one percentage unit increase, a difference of .043 mg/1 results.

To see how this can be used, suppose a BOD_5 is to be run on a sewage lagoon effluent sample. The dilution water DO_i test results in a value of 8.3 mg/1. Thus, the BOD_5 on the diluted sample should be about 3.7 mg/1 (8.3 mg/1 x 45%). Further, suppose that the sample BOD_5 is expected to be around 75 mg/1. Thus, a dilution factor of around 20 (75 mg/1 ÷ 3.7 mg/1) should be used. To obtain this value, 50 ml of sample could be diluted to 300 ml in a BOD bottle. This is the diluted sample that should be used for the BOD_5 test.

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Now, suppose that after 5 days, the BOD on the diluted sample tests out to be 6.0 mg/1. This is a BOD_5 to DO_i percentage of 72 (6.0 mg/1 - 8.3 mg/1 x 100%) and an increase of 27 percentage units (72% - 45%). Recalling that a one percentage unit increase results in a .043 increase in the BOD difference, the 6.0 mg/1 result is possibly low by 1.16 mg/1 (27 x .043). Since the dilution factor was 20, the BOD_5 result obtained for the sample, 120 mg/1 (6.0 mg/1 x 20) is possibly low by 23 mg/1 (1.16 mg/1 x 20). The BOD_5 test should be rerun anticipating a BOD around 143 mg/1 (120 mg/1 + 23 mg/1).

The conclusion to be drawn from this investigation is the diluted sample BOD_5 should be a little less than one-half the initial DO_i of the dilution water. This does not provide a method for correcting a BOD value, although it emphasizes the need to do a greater number of dilutions to obtain the most accurate results.

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- PUBLIC NOTIFICATION - VARIANCES AND EXEMPTIONS

by Arthur Clarkson
Water Quality Bureau

The Safe Drinking Water Act states public notification is the responsibility of public water system owners and operators. Congress, when writing the Act, determined public health must be protected through safe drinking water. They also determined the ultimate source of revenue to provide safe drinking water should be the consumer. The Act provides for public notification to encourage the consumer to support expenditures which will be necessary to provide safe drinking water.

To obtain support for correcting water system problems, water suppliers should use

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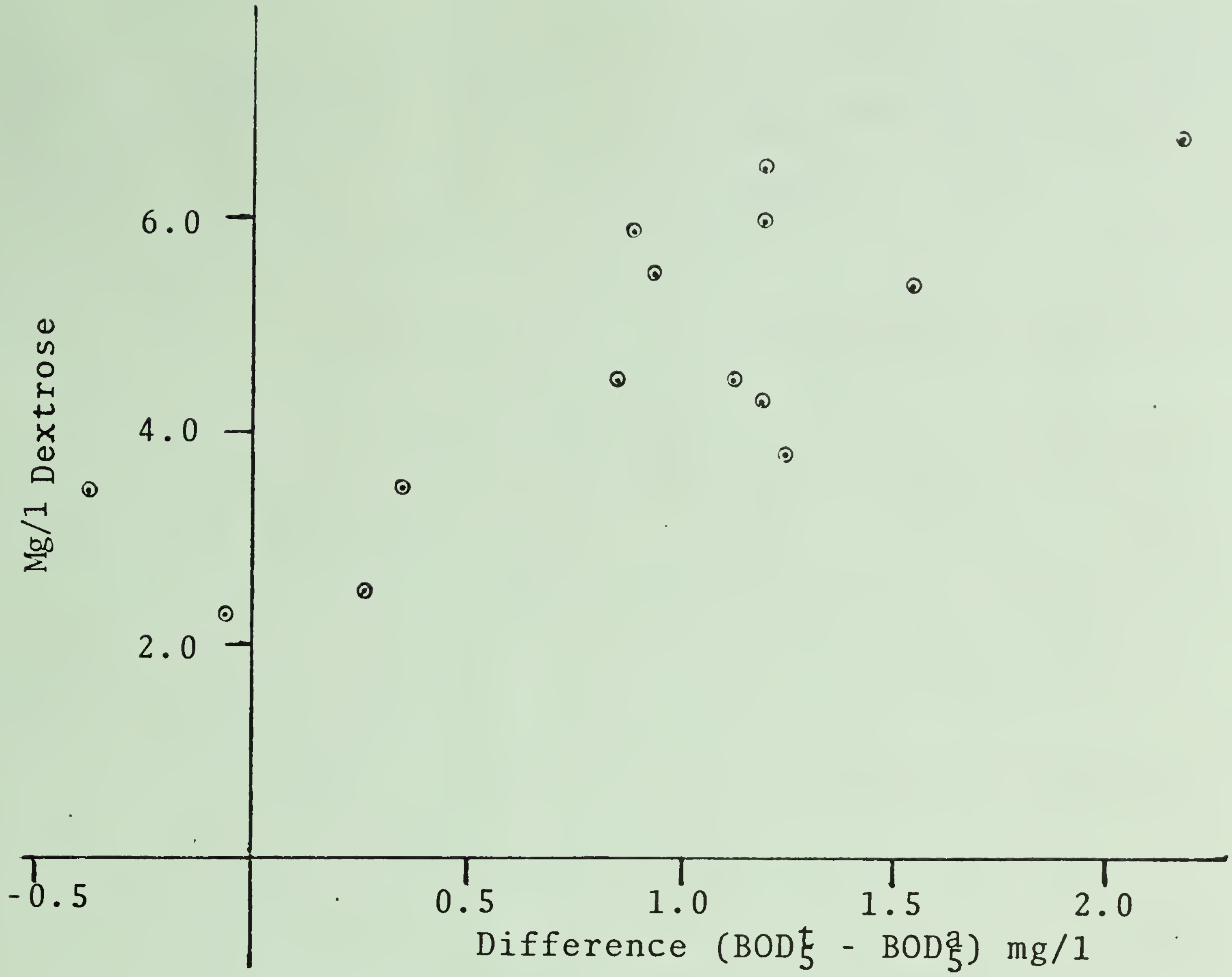

Figure 1

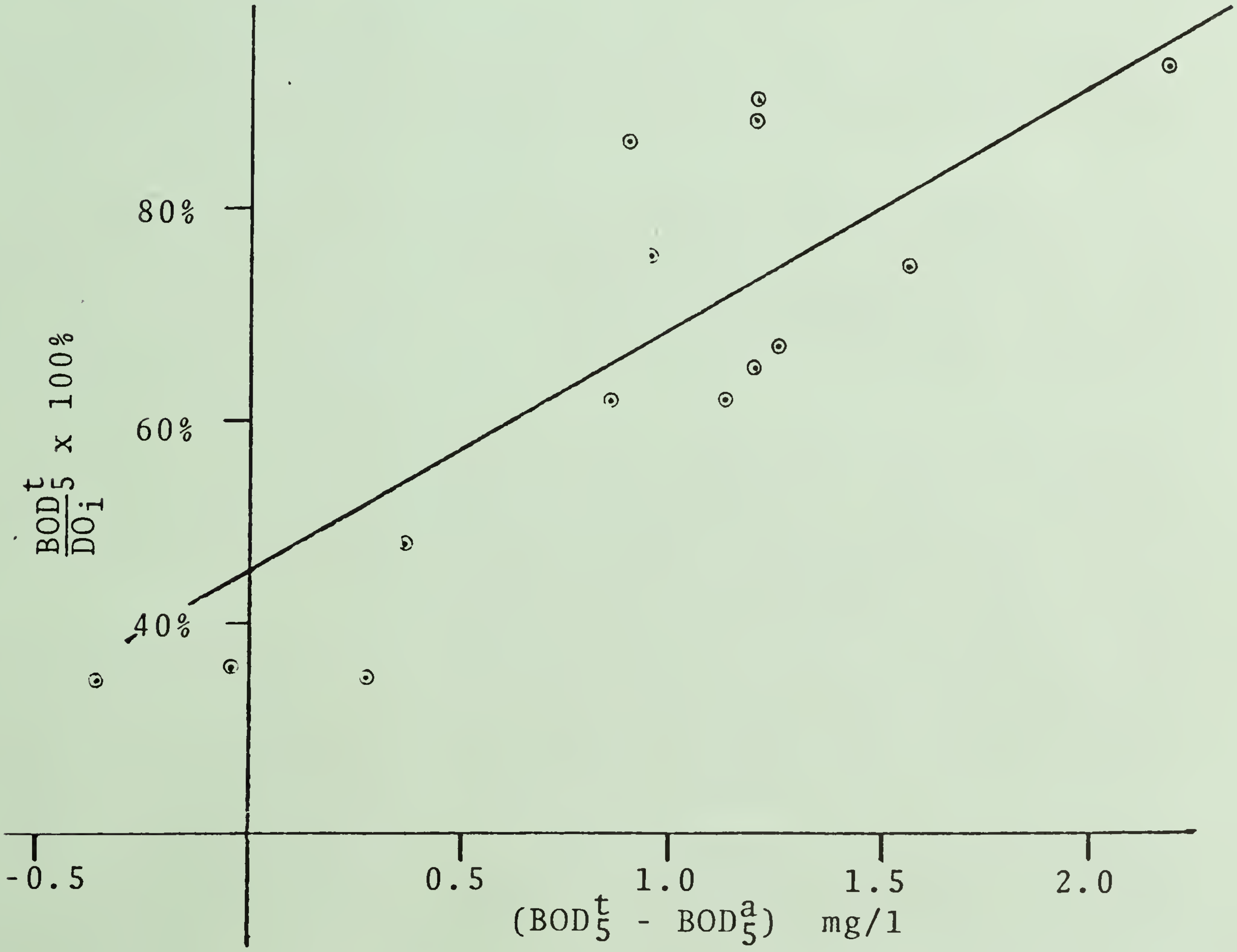

Figure 2

public notification to educate their customers. You may need higher rates, public approval for bond issues, and help from local or state law makers. It is in your best interest to have the public on your side.

Public notification by a community water system must be given for:

1) failure to comply with a maximum contaminant level;
2) failure to comply with a testing procedure;
3) the granting of a variance or exemption from a maximum contaminat level;
4) failure to comply with a variance or exemption schedule; or
5) failure to perform required monitoring.

Public notification by a community water system must be given:

1) in the first set of water bills after the failure or granting of a variance or exemption;
2) within three months and not less than once every three months; and
3) by direct mail, if necessary.

When a community water system fails to comply with a maximum contaminant level, public notification also must be given:

1) in a newspaper of general circulation, within 14 days for 3 consecutive days in a daily paper, or for 3 consecutive weeks in a weekly papaer; and
2) to radio and television stations in the area within 7 days.

It may be to the advantage of the water supplier to inform the consumer of the requirements of the Safe Drinking Water Act, maximum contaminant levels, safety factors of the maximum contaminant levels, present quality of water, problems anticipated, how public notification will be given, any plans the water suppliers may have for improvements, and finally, how this will ultimately affect the customers prior to having to give notification of violations.

The Department has conducted a series of meetings regarding public notifications throughout the state. At these meetings, hand-out material contained model public notices both for advance publicity of the program and a model news release to be used should you have to notify the public of exceeding the maximum contaminant levels or for other reasons. Copies of this material are available from the Water Quality Bureau.

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A variance from a maximum contaminant level or treatment technique may be authorized by the state or EPA when the raw water sources cannot meet the contaminant level specified in the regulations, despite application of the best technological treatment techniques generally available taking cost into consideration. Before a variance from a maximum contaminant level can be granted, the treatment technology or the treatment facility must be in operation. In the case of a maximum contaminant level for turbidity, there must be some type of filtration system or turbidity removal device in operation before a variance can be given.

Reasonable treatment costs is based on the amount of money it would cost a large metropolitan water system to install satisfactory treatment to take care of a specific problem. As an example, if a city like Billings or Great Falls can install adequate treatment facilities to remove turbidity at a reasonable cost, then it is considered feasible for a smaller community to install like treatment to remove turbidity. This is to encourage adjacent smaller water utilities to bank together to form regional water districts. Obviously, this concept does not consider Montana conditions where cities may be 25 or 30 miles apart. Therefore, for many of Montana's towns it may be necessary to resort to the exemption procedure rather than granting variances.

Exemptions may be given for maximum contaminant levels or treatment techniques when due to compelling factors, including economic factors, a public water supply can not meet the requirements. In order for a community to be eligible for an exemption, the water supply must have been in existance as of June 24, 1977. Exemptions can

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not be given for water systems constructed after June 24, 1977. The granting of a variance or exemption is given with the understanding there will not be a reasonable risk to health. Further, within one year of the date that the variance or exemption is granted, a schedule for compliance or increments of compliance will be issued and the water supplier must agree to implement such a schedule. In no case shall an exemption schedule extend beyond January 1, 1981, unless the water supply becomes part of a regional system; then the date would be January 1, 1983. There is no time limit for variances under the act.

For any new regulations that may be developed in the future, a community water supply has a seven year time limit on an exemption (nine years should the community be part of a regional water system).

Application forms for variances and exemptions are available from the Department upon request. Such requests for variances and exemptions should be adressed to the Water Quality Bureau, State Department of Health and Environmental Sciences, Helena, Montana 59601.

The following table shows a comparison of variances and exemptions from maximum contaminant levels as may be granted by the State or EPA:

COMPARISON OF VARIANCES AND EXEMPTIONS FROM MAXIMUM CONTAMINANT LEVELS

	Variance	Exemption
Maximum time specified	No	Yes
Water system must have been in operation on effective date of MCL requirement	No	Yes
Opportunity for public hearing required	Yes	No
Compliance schedule required	Yes	No
Subject to review by EPA	Yes	Yes

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FLUORIDE REMOVAL WORKSHOP

A one day workshop on removal of fluoride from public water supplies will be held on November 8, 1977 from 8:30 AM to 4:30 PM in the E.P.A. Region VI Office in Dallas, Texas. The workshop is for the benefit of the western part of the country.

The primary purpose of the workshop is to determine the technology available and costs of removal of fluorides. Consulting engineers, manufacturers of equipment, regional and state water supply people, and others have been requested to participate in the program.

Anyone interested in attending the workshop can obtain additional information from Charles Severs, Chief, Water Supply Bureau, E.P.A. Region VI, 1201 Elm Street, Dallas, Texas 75270.

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A practical nurse is one who falls in love with a wealthy patient.

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The popularity of TV Western's is even influencing milady's underthings; there's a new brassiere on the market that is patterned after television's Rawhide-it rounds 'em up and head's 'em out.

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A Sunday School teacher reports she was telling her class the story of Lot. "Lot was warned to take his wife and flee out of the city, but his wife looked back and was turned to salt," she said. She looked around at the class and one little girl tentatively raised her hand.

"Yes?" said the teacher.

"I was wondering," said the little girl, "what happened to his flea?"

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CONRAD NEEDS A CLASS I WATER OPERATOR AND A CLASS II WASTEWATER OPERATOR. If interested, please contact E.J. Jury, City Clerk in Conrad 59425.

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PRIORITIES FOR CONSTRUCTION GRANTS and FUTURE SEWAGE TREATMENT

by D.G. Willems

On July 26, 1977, a public hearing was held at Helena on the Department of Health priority list for construction grants. The higher priority projects are those which will allow a community to meet wastewater discharge permit limits and water quality standards or those which are eliminating a community wide public health hazard. The State has about 6 million dollars of unallocated federal grant funds. The majority of these funds are being held for actual construction of projects already in the grant process. The grant process consists of three stages: (1) Facility planning to determine the most appropriate and cost effective treatment; (2) Construction plans and specifications; and (3) Construction.

Unless Congress provides additional authorization and appropriation of more funding, many of the State projects will fall behind on their established compliance schedules. The 6 million dollars remaining will not last long. Congress is considering additional funding through amendment of Public Law 92-500 (Water Pollution Control Act Amendments of 1972). However, many additional amendments have been proposed along with the construction grant funding. Even though funding of construction grants appears to be the less controversial of the amendments, the funding could be held up while the more controversial items are argued. For how long, is anybody's guess.

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In addition to the Congressional amendments of the law itself, EPA is proposing relaxation of the suspended solids limits for sewage lagoon discharges through amendment of regulations. This could mean many of our lagoons may not need the extensive improvements which appeared inevitable. Very possibly, a long holding time (perhaps 200 days) and periodic discharge could meet the proposed standards on effluent which have good stream dilution. This brings up the need for a good testing program, so it is known what quality effluent is being discharged.

The Water Quality Bureau of the State Department of Health and Environmental Sciences, along with neighboring states, have argued with EPA for many years that a complicated sewage treatment facility for a small community would provide sewage effluent of a poorer quality than the typical lagoon installation which requires a minimum of operation and maintenance.

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